

AMENDMENTS TO THE CLAIMS

Please cancel claims 17-20, 50, 54, and 80-109 without prejudice to pursue these claims in a future continuation application or an already-filed continuation application, and amend claims 51, 55, 56, and 59, as follows:

1. (Allowed) A method of gating radiation for a computed tomography procedure, comprising:
measuring a first set of signal data representative of a physiological movement of a patient during a first time period;
pattern matching the first set of signal data with a second set of signal data related to measured physiological movement of a patient during a second time period to identify degree of deviation from periodicity of the physiological movement; and
gating radiation to the patient if the degree of deviation from periodicity exceeds a threshold based upon results of the pattern matching.
2. (Allowed) The method of claim 1 in which the first set of signal data and the second set of signal data are pattern matched using an autocorrelation function.
3. (Allowed) The method of claim 1 in which the first set of signal data and the second set of signal data are pattern matched using an absolute difference function.
4. (Allowed) The method of claim 1 further comprising:

determining a degree of match between the first set of signal data and the second set of signal data.

5. (Allowed) The method of claim 4 in which the degree of match is determined by a secondary peak value of an autocorrelation function.

6. (Allowed) The method of claim 4 in which the degree of match is determined by a secondary minimum value of an absolute difference function.

7. (Allowed) The method of claim 4 further comprising:
comparing the degree of match to a threshold range.

8. (Allowed) The method of claim 7 in which the degree of match outside the threshold range indicates deviation from a normal physiological movement.

9. (Allowed) The method of claim 7 in which the degree of match within the threshold range indicates a repetitive physiological movement.

10. (Allowed) The method of claim 9 in which a point of best match indicates a period of the physiological movement.

11. (Allowed) The method of claim 1 further comprising:
predicting a period of the physiological movement during a third time period.

12. (Allowed) The method of claim 11 further comprising:
predictively actuating a gating system component based upon the predicted period.
13. (Allowed) The method of claim 1 further comprising:
determining a period of the physiological movement.
14. (Allowed) The method of claim 13 further comprising:
defining a treatment interval to apply radiation to a patient.
15. (Allowed) The method of claim 14 in which the treatment interval is defined by phase of the
physiological movement.
16. (Allowed) The method of claim 1 in which the second set of signal data is a data model of
the physiological movement of the patient.
- 17-25. (Canceled)
26. (Allowed) A method of gating the application of radiation for a CT procedure, comprising:
measuring signal data representative of at least a portion of a physiological movement to
form a set of ordered measurement samples;

pattern matching the set of ordered measurement samples against prior measurement samples of the physiological movement to determine deviation from periodicity of the set of ordered measurement samples; and

gating CT radiation to the patient if the deviation from periodicity is outside a threshold range.

27. (Allowed) The method of claim 26 in which the second set of ordered measurement samples overlaps with the prior measurement samples.

28. (Allowed) The method of claim 26 in which the step of pattern matching comprises shifting the set of ordered measurement samples against the prior measurement samples at a plurality of offset sample positions to determine position of best match.

29. (Allowed) The method of claim 28 in which an absolute difference function is used to determine the position of best match.

30. (Allowed) The method of claim 26 further comprising:
determining a predicted value for an additional measurement sample for the physiological movement.

31. (Allowed) The method of claim 30 in which radiation gating occurs if the predicted value deviates from the additional measurement sample beyond a designated threshold level.

32. (Allowed) The method of claim 28 in which a search range for position of best match is established based upon a predicted position, in which the predicted position is based upon a period established from the prior measurement samples.
33. (Allowed) The method of claim 26 in which the physiological movement comprises breathing movement.
34. (Allowed) The method of claim 26 in which pattern matching is performed using an autocorrelation function.
35. (Allowed) The method of claim 26 in which pattern matching is performed using an absolute difference function.
36. (Allowed) The method of claim 26 further comprising:
defining an interval range to apply radiation to a patient.
37. (Allowed) The method of claim 36 in which the interval range is defined based upon phase of the physiological movement.
38. (Allowed) A method of gating radiation, comprising:
receiving a set of signal data representative of a physiological movement of a patient;
estimating phase of the set of signal data;

comparing a vector of the set of signal data with one or more prior sets of signal data to identify deviation from periodicity of the physiological movement, the vector of the set of signal data based upon the phase, the one or more prior sets relating to measured physiological movement of a patient during one or more prior time periods; and

gating radiation to the patient if the deviation from periodicity is identified.

39. (Allowed) The method of claim 38 in which the phase is estimated by calculating period of the set of signal data.

40. (Allowed) The method of claim 39 further comprising:

computing an inner product of a Cosine waveform with the period T and most recent T-seconds-long segment of the signal data to form an in-phase component;

computing the inner product with a sine waveform of the period T to form a quadrature component; and

computing the inverse Tangent of result of dividing the quadrature component by the in-phase component to estimate the phase.

41. (Allowed) The method of claim 39 further comprising:

identifying an assumption for the period;

estimate location values for maximum and minimum values; and

based upon one or more sample sets, estimating the period.

42. (Allowed) The method of claim 38 in which the vector comprises amplitude and phase components.
43. (Allowed) The method of claim 38 in which the act of comparing the vector of the set of signal data with the one or more prior sets of signal data to identify deviation from periodicity of the physiological movement comprises:
using a 2-dimensional histogram array of signal versus phase values.
44. (Allowed) The method of claim 43 in which the 2-dimensional histogram array is accumulated during prior recordings of the physiological movement.
45. (Allowed) The method of claim 43 further comprising:
comparing the vector against with other values in the 2-dimensional histogram array;
forming a clustering factor; and
identifying deviation from periodicity if clustering factor exceeds a threshold.
46. (Allowed) The method of claim 38 in which the physiological movement comprises respiration activity.
47. (Allowed) The method of claim 46 further comprising:
estimating latest inhale values, latest exhale extreme values, and corresponding time points.
48. (Allowed) The method of claim 38 in which the radiation comprises therapeutic radiation.

49. (Allowed) The method of claim 38 in which the radiation relates to a CT procedure.
50. (Canceled)
51. (Currently Amended) ~~The method of claim 50 in which~~ A method for gating an execution of a medical procedure, comprising:
collecting data samples for a physiological movement;
analyzing the data samples to identify deviation from periodicity; and
gating an execution of the medical procedure if deviation from periodicity is identified;
wherein the act of gating the execution of the medical procedure comprises gating the application of radiation.
52. (Original) The method of claim 51 in which the medical procedure comprises a computed tomography procedure.
53. (Original) The method of claim 51 in which the medical procedure comprises a radiotherapy procedure.
54. (Canceled)
55. (Currently Amended) The method of claim ~~54 in which~~ 56, wherein the gating of data acquisition comprises binning data.

56. (Currently Amended) ~~The method of claim 54 in which~~ A method for gating an execution of a medical procedure, comprising:

collecting data samples for a physiological movement;

analyzing the data samples to identify deviation from periodicity; and

gating an execution of the medical procedure if deviation from periodicity is identified;

wherein the act of gating the execution of the medical procedure comprises gating of data acquisition, and the medical procedure comprises an emission imaging method.

57. (Original) The method of claim 56 in which the emission imaging method comprises an MRI procedure.

58. (Original) The method of claim 56 in which the emission imaging method comprises a PET procedure.

59. (Currently Amended) The method of claim ~~50 in which~~ 56, wherein the gating is performed not in real-time with the collecting.

60-109. (Canceled)